

WHAT IS CLAIMED IS:

1. An apparatus for treating an intervertebral disc having an inner nucleus pulposus and an outer annulus fibrous, which comprises:
a thermal probe defining proximal and distal ends and having a guidable region adjacent the distal end thereof, the guidable region characterized by having sufficient rigidity to advance within the annulus fibrous of the intervertebral disc in response to an axial force exerted on the proximal end of the thermal probe while having sufficient flexibility to substantially follow and conform to an azimuthal course defined by the natural striata of the annulus fibrous, the thermal probe being adapted for connection to a thermal energy source to provide thermal energy to the annulus fibrous to alleviate pain associated with the intervertebral disc.
2. The apparatus according to claim 1 wherein the guidable region includes a thermal transmitting element for transmitting thermal energy to the intervertebral disc.
3. The apparatus according to claim 1 wherein the guidable region includes a helical spring.
4. The apparatus according to claim 1, including a cannula to facilitate introduction of the thermal probe into the intervertebral disc, the cannula defining a lumen to receive the thermal probe, the thermal probe being advanceable within the lumen.
5. The apparatus according to claim 4 wherein the cannula includes an arcuate end portion, the arcuate end portion dimensioned to arrange the guidable region of the thermal probe at a desired orientation within the annulus fibrous.
6. The apparatus according to claim 5 wherein the cannula defines a penetrating distal end dimensioned to penetrate the intervertebral disc.

7. The apparatus according to claim 5 wherein the cannula includes an index marker adjacent a proximal end thereof to indicate a direction of the arcuate end portion.

8. The apparatus according to claim 4, further including impedance measuring means associated with the cannula to monitor the impedance of tissue adjacent a distal end of the cannula to provide an indication relating to tissue condition or type.

9. The apparatus according to claim 8 wherein the impedance measuring means includes a stylet positionable within a lumen of the cannula.

10. The apparatus according to claim 1 wherein the guidable region of the thermal probe defines a pre-shaped curved configuration to facilitate advancement along the azimuthal course defined by the natural striata of the annulus fibrous.

11. The apparatus according to claim 10 wherein the guidable region comprises a shape memory material.

12. The apparatus according to claim 2 wherein the thermal transmitting element is a resistive heating element.

13. The apparatus according to claim 2 wherein the thermal transmitting element is a radio-frequency electrode.

14. The apparatus according to claim 2 wherein the thermal transmitting element is a microwave antenna.

15. The apparatus according to claim 2 wherein the thermal transmitting element is a laser transmitting member.

16. The apparatus according to claim 1 including temperature sensing means

for sensing temperature of tissue during application of thermal energy.

17. An apparatus for alleviating pain in an intervertebral disc having an inner nucleus pulposis and an outer annulus fibrosis, which comprises:

a cannula having a proximal end and a distal end, and defining a longitudinal axis, the cannula having an arcuate portion adjacent the distal end and being angular offset with respect to the longitudinal axis, the arcuate portion positionable at a desired angular position with respect to the intervertebral disc to provide a guide into a pre-selected area of the outer annulus fibrous;

a thermal probe received within the cannula, the thermal probe having a flexible probe portion adjacent a distal end thereof, the thermal probe advanceable within the cannula whereby the flexible probe portion bends within the arcuate portion of the cannula to be guided into the pre-selected area of the annulus fibrous; and

a thermal energy source connected to the thermal probe.

18. The apparatus according to claim 17 wherein the flexible probe portion is dimensioned and configured to permit advancement within the annulus fibrous and conform to a generally arcuate course defined by the natural striata of the annulus fibrous.

19. The apparatus according to claim 18 wherein the flexible probe portion includes a helical spring.

20. A method for relieving pain associated with an intervertebral disc having a disc nucleus pulposus and an outer annulus fibrous surrounding the nucleus pulposus, comprising;

introducing a thermal transmitting element of a thermal probe into the annulus fibrous of the intervertebral disc; and

supplying thermal energy from a thermal energy source to the thermal transmitting element to heat the annulus fibrous adjacent the transmitting element sufficiently to relieve pain associated with the intervertebral disc.

21. The method according to claim 20 wherein the thermal probe includes a flexible probe portion and further including the step of advancing the thermal probe whereby the flexible probe portion follows a generally arcuate path within the annulus fibrous.

22. The method according to claim 21 wherein the step of advancing the thermal probe includes passing the flexible probe portion generally along an arcuate path defined by natural striata of the annulus fibrous.

23. The method according to claim 21 wherein the step of advancing includes positioning the thermal transmitting element adjacent at least one of a posterior section, lateral section and posterior-lateral section of the annulus fibrous.

24. The method according to claim 23, including the step of accessing the annulus fibrous from a posterior-lateral section of the intervertebral disc.

25. The method according to claim 21 further including the step of positioning a cannula adjacent the intervertebral disc and passing the thermal probe through a lumen of the cannula into the outer annulus fibrous.

26. The method according to claim 25 wherein the cannula includes an arcuate portion adjacent a distal end thereof and wherein, during the step of advancing the thermal probe, the arcuate cannula portion guides the flexible probe portion along the path through the annulus fibrous.

27. The method according to claim 26 wherein the step of positioning includes at least partially introducing the distal end of the cannula into the annulus fibrous.

28. The method according to claim 27 further including the step of angulating the arcuate portion to a desired orientation within the annulus fibrous.

29. The method according to claim 20 including the step of monitoring impedance of tissue to detect variations in tissue-type to thereby facilitate positioning of the thermal transmitting element in the annular fibrous.

30. The method according to claim 20 including the step of monitoring the position of the at least the thermal transmitting element with imaging means.

31. A method for relieving pain associated with an intervertebral disc, the intervertebral disc having a disc nucleus and an outer annulus surrounding the disc nucleus, the method comprising the steps of:

accessing an intervertebral disc with a cannula;

advancing a thermal probe having a heat transmitting region through the cannula into the intervertebral disc to position the heat transmitting region of the thermal probe in at least one of posterior, lateral and posterior-lateral areas of the annulus fibrous; and

supplying thermal energy from a thermal energy source to the heat transmitting end region to heat the at least one area to treat pain associated with the intervertebral disc.

32. The method according to claim 31 wherein the step of accessing includes advancing a distal end of the cannula through the intervertebral disc to position the distal end within the annulus fibrous.

33. The method according to claim 32 wherein the cannula includes an arcuate portion adjacent the distal end thereof and further including the step of manipulating the arcuate portion to a desired orientation with respect to the annulus fibrous.

34. The method according to claim 33 wherein the heat transmitting region of the thermal probe is substantially flexible and wherein during the step of advancing, the heat transmitting region bends within the arcuate portion of the cannula.

35. The method according to claim 32 wherein the cannula includes impedance means and wherein the step of accessing includes monitoring impedance of tissue to ascertain a location of the distal end of the cannula in relation to the intervertebral disc.

36. The method according to claim 35 wherein the step of monitoring impedance of tissue further includes monitoring a plurality of impedance interfaces including the tissue and a cortex of the intervertebral disc, the cortex and the outer annulus of the intervertebral disc, and the annulus and the nucleus of the intervertebral disc.